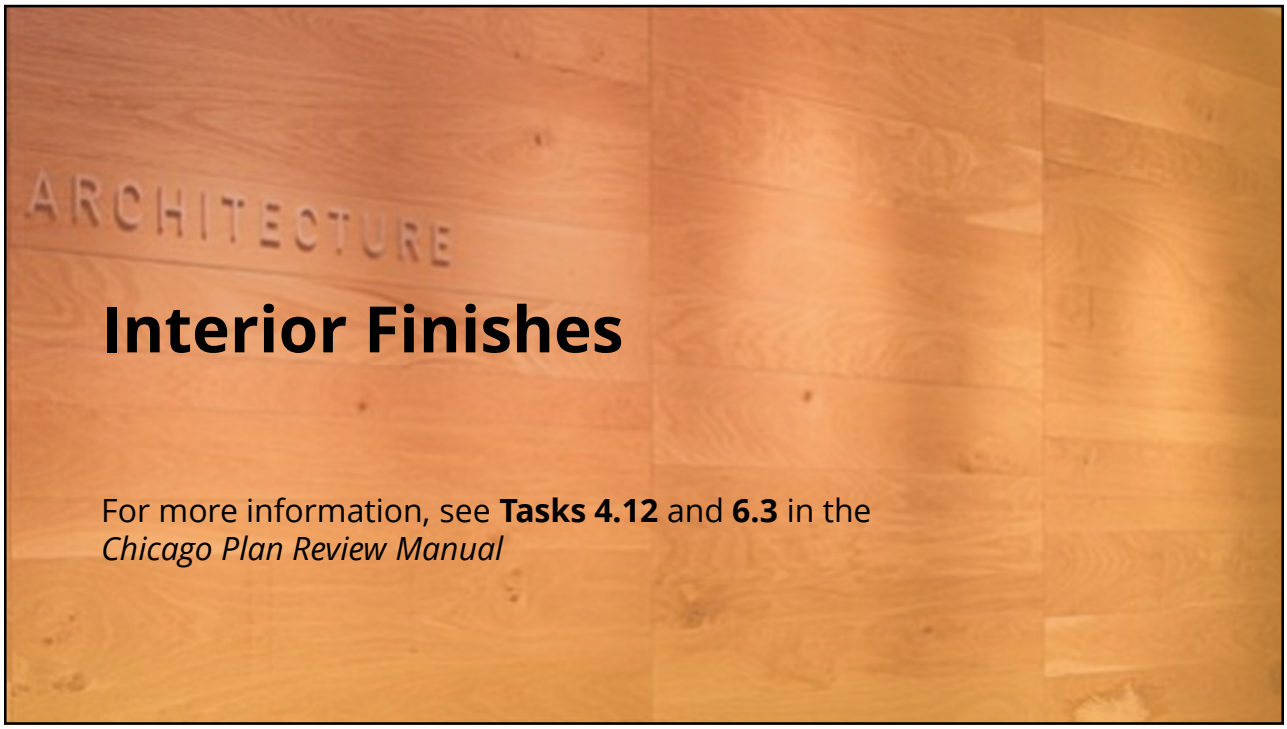
Afternoon Session 1: Interior Finishes, Fire Protection Systems, and Structural

1. Interior Finishes
2. Fire Protection and Life Safety Systems
3. Structural Basics



Interior Finishes

For more information, see **Tasks 4.12** and **6.3** in the *Chicago Plan Review Manual*

CODE BOOK

Definitions

- **INTERIOR FINISH.** Interior finish includes *interior wall and ceiling finish* and *interior floor finish*.
- **INTERIOR FLOOR FINISH.** The exposed floor surfaces of buildings including coverings applied over a finished floor or *stair*, including risers.
- **INTERIOR FLOOR-WALL BASE.** *Interior floor finish trim* used to provide a functional or decorative border at the intersection of walls and floors.

Definitions (continued)

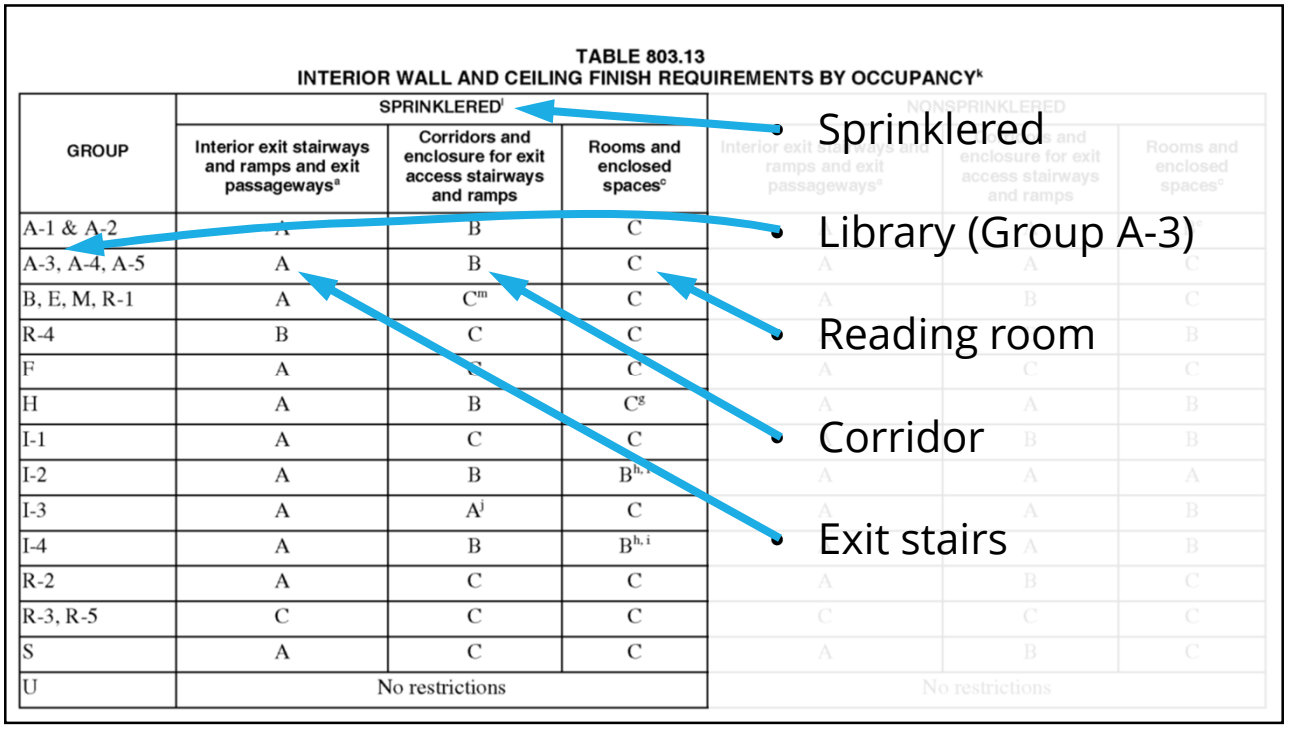
- **INTERIOR WALL AND CEILING FINISH.** The exposed *interior surfaces* of buildings, including but not limited to: fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including *trim*.
- **TRIM.** Picture molds, chair rails, baseboards, *handrails*, door and window frames and similar decorative or protective materials used in fixed applications.

Interior Wall and Ceiling Finishes

- Most interior wall and ceiling finish materials must be classified (based on flame spread and smoke development) as either Class A, Class B, or Class C based on testing.
- The code also allows wall coverings to be tested to NFPA 286, which is deemed equivalent to a Class A rating.
- Interior finishes must be as specified in Table 803.13.
- (This requirement does not apply to material with a thickness less than 0.036 inches—excluding paint and wallpaper)

TABLE 803.13
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY[k]

GROUP	SPRINKLERED[j]			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways[a]	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces[c]	Interior exit stairways and ramps and exit passageways[a]	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces[c]
A-1 & A-2	A	B	C	A	A	B[e]
A-3, A-4, A-5	A	B	C	A	A	C
B, E, M, R-1	A	C[m]	C	A	B	C
R-4	B	C	C	A	B	B
F	A	C	C	A	C	C
H	A	B	C[g]	A	A	B
I-1	A	C	C	A	B	B
I-2	A	B	B[h, i]	A	A	A
I-3	A	A[j]	C	A	A	B
I-4	A	B	B[h, i]	A	A	B
R-2	A	C	C	A	B	C
R-3, R-5	C	C	C	C	C	C
S	A	C	C	A	B	C
U	No restrictions			No restrictions		

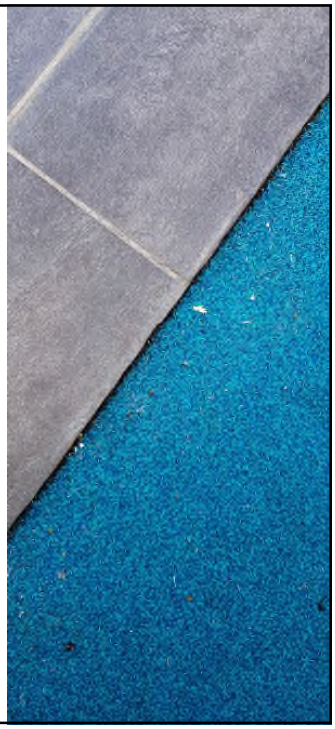


Interior Wall and Ceiling Finishes (continued)

- Textile and expanded vinyl wall coverings and ceiling coverings have additional requirements
- High-density polyethylene (HDPE) and polypropylene (PP) wall coverings must be tested under special standard
- Additional testing requirements apply to:
  - Site-fabricated stretch systems
  - Laminated finishes over wood/combustible substrates
  - Site-applied wood facings and veneers
- Additional rules apply to finishes on fire-resistance rated assemblies.

Interior Floor Finishes

- Traditional floor finish and floor covering materials that are not comprised of fibers, such as wood, vinyl, linoleum or terrazzo, and resilient floor covering, are not subject to any special fire performance requirements.
- Fibrous floor finishes in exits and exit discharge vestibules/lobbies must be Class I.
- Floor finishes in other areas must be Class I, Class II or meet the CPSC “pill test” per Sec. 804.4.



Decorative Materials and Trim

- Combustible trim (including foam plastic) may not exceed 10 percent of the specific wall or ceiling area to which it is attached.
  - The surface area of combustible handrails and freestanding guardrails is not included in calculating the 10 percent limit.
- Material, other than foam plastic used as interior trim must have a minimum Class C flame rating when tested in accordance with ASTM E84 or UL 723.
- Foam plastic trim has limited dimensions and density, if met, no thermal barrier is required and smoke-developed index is not limited.

Decorative Materials and Trim (continued)

- Where interior floor-wall base does not comply with the requirements for wall trim:
- Interior floor-wall base that is 6 inches or less in height must be tested in accordance with requirements for floor finishes and must be at least Class II.
- Where a Class I floor finish is required, the floor-wall base must be Class I.
- For example, this might include a detail where the floor covering material is used as the floor-wall base.

Decorative Materials and Trim (continued)

Decorative Materials

- In Group A, B, E, I, M and R-1 occupancies and in Group R-2 dormitories, curtains, draperies, fabric hangings, and similar combustible decorative materials suspended from walls or ceilings must meet the flame propagation performance criteria of NFPA 701, Test 1 or Test 2, or exhibit a maximum heat release rate of 100 kW when tested per NFPA 289 with a 20 kW ignition source.

Fire Protection and Life Safety Systems

For more information, see **Module 5** in the *Chicago Plan Review Manual*

KEY CONCEPT

Automatic Sprinkler Systems

- 3 sprinkler installation standards
  - NFPA 13
  - NFPA 13R (Low-rise Residential)
  - NFPA 13D (Groups R-4, R-5 only)
- A building is not fully sprinklered if a portion uses an alternative automatic extinguishing system (chemical, etc.)
- Sprinkler system requires separate permit from Chicago Fire Department, Fire Prevention Bureau

Automatic Sprinkler Systems (continued)

Sprinkler system triggers:

- Based on occupancy classification of building or fire area
- Specific building areas/hazards (underground parking)
- Buildings over 70 feet in height
- Incidental uses
- Additional requirements for fire suppression systems

KEY CONCEPT

Fire Areas

A fire area separation is not the same as a mixed-occupancy separation. The required fire-resistance rating for fire area separations is in Table 707.3.10:

TABLE 707.3.10
FIRE-RESISTANCE RATING REQUIREMENTS FOR FIRE BARRIERS OR HORIZONTAL ASSEMBLIES BETWEEN FIRE AREAS

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2, U	2

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements

Occupancy	Fire Area (ft^2)	Occupant Load (persons)	Stories Above / Below Grade
A-1, A-3, A-4 [a, e]	> 12,000	300	—
A-2 [a, e]	> 12,000	300 / 100 [j]	—
A-3 [d, e] (exhibition area)	> 5,000	—	—
A-5 [a, b, c]	> 1,000	—	—
B [f] (ambulatory care)	—	—	1 / 1 [g]
B (telephone exchange)	Note h	—	—

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	**Fire Area** (ft^2)	**Occupant Load** (persons)	**Stories Above / Below Grade**
E-1 [d, i]	> 7,200	—	—
E-2	Note h	—	—
F-1 [k] (general)	> 12,000	—	3 / NA
F-1 [k] (upholstery, woodworking)	> 2,500	—	—
F (electricity generation)	Note h	—	—
H	Note h	—	—

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	**Fire Area** (ft^2)	**Occupant Load** (persons)	**Stories Above / Below Grade**
I	Note h	—	—
M [k] (general)	> 12,000	—	3 / 1
M [k] (upholstered furniture)	> 5,000	—	—
R-1, R-2, R-3, R-4	Note h	—	—

- Never required for R-5
- Limited exception for R-2 (903.2.8, Exception 1)

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements

Occupancy	Fire Area (ft^2)	Occupant Load (persons)	Stories Above / Below Grade
S-1 [k, m] (general)	> 12,000	—	3 / NA
S-1 [k] (commercial vehicles)	> 5,000	—	3 / NA
S-1 [k] (upholstered furniture)	> 5,000	—	3 / NA
S-1 [k, l] (repair garage)	> 12,000	—	2 / 1
S-2 (general)	> 12,000	—	1
S-2 [n] (parking garage)	> 12,000	—	NA / 1

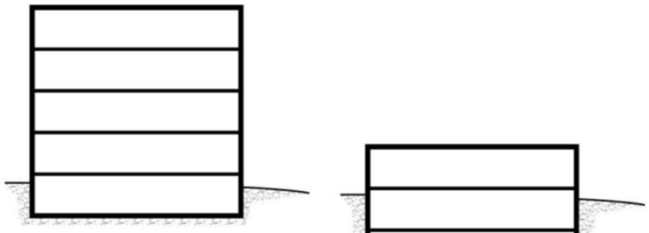
Automatic Sprinkler Systems (continued)

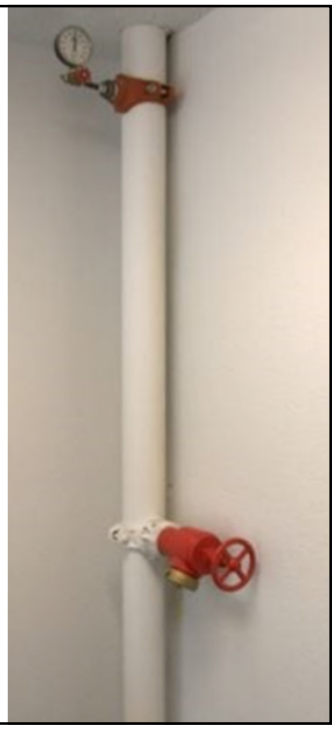
- Specific hazards:
  - Stories without openings / basements
  - Rubbish and linen chutes
  - Shops and storerooms
  - Telecommunication equipment areas > 150 ft^2
- Incidental uses (Table 509)
- Additional required suppression systems (Table 903.2.11.8)

KEY CONCEPT

Standpipe Systems

- Required in buildings with 4 or more stories above grade or 2 or more basements
  - For Groups R-2, R-3, R-4 and R-5 not required if 4 or fewer stories above grade





Standpipe Systems (continued)

Other standpipe triggers:

- Group A occupancies with OL > 1,000
- Stages > 1,000 ft²
- Underground buildings (Sec. 405)
- Helistop or heliport
- Vegetative or landscaped roof; occupiable rooftop

- In buildings where standpipes are required, ensure adequate space is provided at stair landings and other required locations

KEY CONCEPT

Fire Alarm and Detection Systems

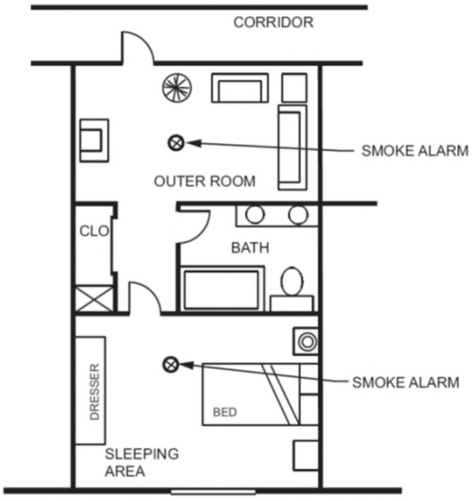
- **Manual** – Relies on manual fire alarm boxes or pull stations to activate a notification sequence.
- **Automatic** – Relies on input from devices that detect smoke or heat without occupant interaction or my activate based on waterflow.
- **Presignal-type** – Does not automatically initiate occupant notification throughout the building; notifies trained personnel at constantly-attended location. Required in high-rise buildings by the Chicago Fire Department.

Fire Alarm and Detection Systems (continued)

- Manual fire alarm system requirements summarized in Table on p. II-130 of *Manual*.
- Where code allows elimination of pull stations throughout building (usually due to sprinklers), pull stations must still be installed at each exit on the level of exit discharge. (907.2)

Single- or Multiple-station Smoke Alarms

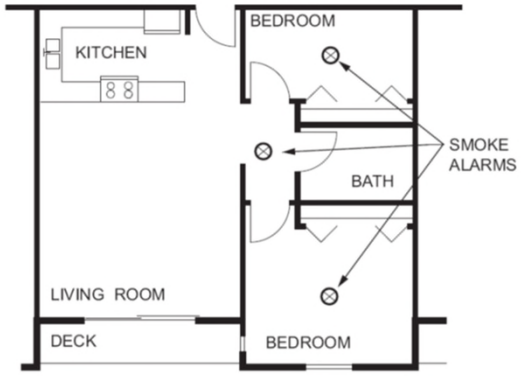
- **Group R-1**
  - In sleeping areas.
  - In every room in the path of the means of egress from sleeping area to door leading from sleeping unit.
  - In each story within the sleeping unit, including basements.
  - At the uppermost ceiling of each interior exit stairway.



Single- or Multiple-station Smoke Alarms (continued)

Groups R-2, R-3, R-4 and R-5

- On ceiling or wall outside of and within 15 feet of each room used for sleeping.
- In each room used for sleeping.
- In each story within a dwelling unit, including basements but not including crawl spaces and uninhabitable attics.
- At the uppermost ceiling of each interior exit stairway.



Single- or Multiple-station Smoke Alarms (continued)

- Where more than one smoke alarm is required to be installed within an individual dwelling unit or sleeping unit in Group R or I-1 occupancies, the smoke alarms must be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit.
  - Physical interconnection of smoke alarms is not required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.
- Limits on placement of certain types of smoke alarms near cooking appliances, bathrooms.

KEY CONCEPT

Portable Fire Extinguishers

- Fire extinguishers are required in most occupancies.
- Make allowances for fire extinguisher placement
  - Surface mounted could create obstruction
  - Recessed cabinets must maintain fire-resistance rating of wall construction
- Locations must be conspicuous and unobstructed.
- For most commonly-required type, maximum travel distance is 75 ft.

KEY CONCEPT

Carbon Monoxide Detection

- Required in Groups E, I-1, I-2, I-4, and R where hazard exists:
  - Fuel-burning appliances
  - Fuel-burning fireplace
  - Attached private garage
- May be combined with smoke alarms
- May be part of building alarm system

KEY CONCEPT

Structural Peer Review

- Required per Table C-2:

TABLE C-2 (2020): STRUCTURAL PEER REVIEW REQUIREMENTS

Use or Occupancy Classification of Finished Building	Scope of Work	
	New Construction & Additions	Repairs, Renovations & Alterations
All buildings	- work includes adding balcony to existing building - work includes construction within 1 foot of property line - work includes excavation ≥ 10 feet below grade	Structural scope of work includes: - adding, altering, or removing load-bearing elements - adding, altering, or removing floor openings - use of earth retention system
Exclusively residential use	- scope of work exceeds 3 stories above grade plane - scope of work includes occupiable rooftop above third story above grade plane	- structural scope of work in building greater than 3 stories above grade plane
Any non-residential use	- scope of work exceeds 1 story above grade plane - scope of work includes occupiable rooftop above second story above grade plane - work includes excavation ≥ 5 feet below grade within 5 feet of an existing building	- structural scope of work in building greater than 1 story above grade plane

REFERENCE

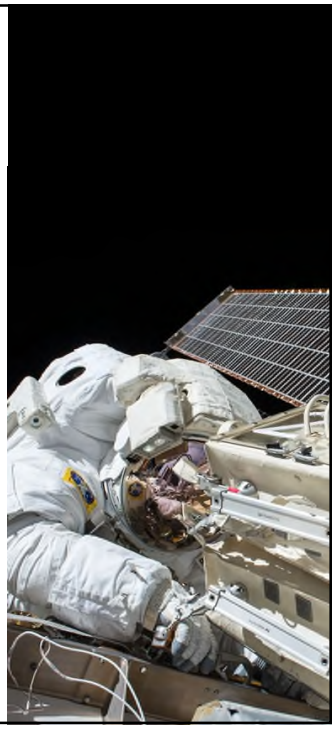
Structural Loads

Gravity Loads

- Dead Loads
- Live Loads
- Snow Loads
- Flood Loads
- Rain/Ice Loads

Lateral Loads

- Wind Loads
- Earthquake Loads



Load Paths (1604.4)

- Gravity Load Path
  - Member sizing
  - Unsupported or compromised elements
- Lateral Load Path
  - Connections!

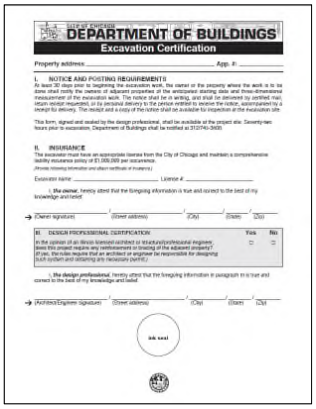
CHICAGO AMENDMENT

Excavation Notices

- *Administrative Provisions* Sec. 406

- More than 10 feet below existing grade
- More than 5 feet below existing grade and within 5 feet of an existing building on a different lot **or** the public way

- Underpinning plan may be required.


DEPARTMENT OF BUILDINGS
Excavation Certification

Geotechnical Report

- No report required
  - Single-story storage buildings up to 2,000 ft²
  - Alterations and additions, load increase < 5% existing capacity
- Limited or deferred report
  - Design bearing pressure limited by Table 1806.2(2)
- Report required before permit issuance
  - Excavation or soil penetration > 8 ft below existing grade
  - Construction exceeding 4 stories above grade
  - Construction covering more than 16,000 ft² ground area
  - Less conservative design bearing pressure

Foundations

- If no geotechnical report at time of permitting, presumptive lateral soil pressure in Table 1610.1
- Dampproofing and waterproofing per Sec. 1805
- Prescriptive foundation design options in Sec. 1807
- For more information on footing and foundation design basics, see Task 8.4

KEY CONCEPT

Structural Risk Category

- **Category I:** lowest risk
  - Agricultural and storage structures
- **Category II:** average risk
  - Most buildings
- **Category III:** heightened risk
  - Denser occupant concentration, utilities, regulated substances
- **Category IV:** critical facilities
  - Emergency response: medical, government, utilities, aviation
  - Hazardous materials

CHICAGO AMENDMENT

Load Placards

- *Administrative Provisions* Sec. 803
- No longer issued/reviewed by Department
- Required if design live load **> 100 psf**
- Calculation must be certified by architect/engineer
- Sign must be posted by owner before C of O inspection

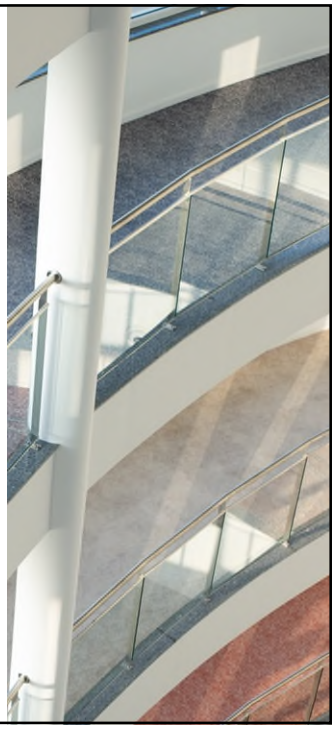
Special Inspections

- Watch for more information coming in Spring 2020
- Will require design professional to complete and file special inspection schedule with permit applications

CODE BOOK

For more information…

- Single-wythe masonry limitations (2101.2.2)
- Fireplaces and chimneys (2111-2113)
- Steel light-frame construction (2211)
- Heavy timber (2304.11)
- Conventional light-frame construction (2308)
- Structural glass (Ch 24)
- Glass guards (2407)
- Safety glazing / impact areas (Ch. 24, Task 6.4)




Questions and Answers
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